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The North Granite Mountains fault is a 95-km-long east-west trending fault on the northern margin of the Granite Mountains. Quaternary pedlment surfaces along and adjacent to the present drainage divides are not displaced, indicating that the fault has been inactive since at least the middle Pleistocene.

№ 7222

EASTERN SNAKE RIVER PLAIN NEOTECTONICS: FAULTING IN LAST 15 MA MIGRATES ALONG AND OUTWARD FROM YELLOWSTONE "HOTSPOT" TRACK

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In the eastern Snake River Plain (SRP) region, major Quaternary faults (faults along escarpments >1000 m high that have >1-offset in the last 15,000 yr) occur in E- and NNE-trending belts that converge on Yellowstone. Quaternary extension N of the plain is SW on NW-trending structures except near Yellowstone where it is S on E-trending structures; extension south of the plain is W on N-trending structures. The two belts form a "V" analogous to the wake of a boat that has moved NE up the plain, except that the southern belt flares further outward.

Since 15 Ma, silicic volcanic fields containing immense plain-wide calderas and associated heating have migrated up the plain at 3-4 cm/yr. Late Cenozoic faults associated with caldera collapse and crustal cooling extend far beyond the immediate margin of the plain; their number increases toward the plain.

Projecting the wake-pattern model back in time, the age of late Cenozoic faulting south of the plain appears compatible with increasingly older positions of the "wake" further to the SW, as indicated by the following locations and periods of major faulting (from W to E): Raft River valley, 9->5? Ma; Portneuf Range, 7-6.7 Ma; Blackfoot Range, 5.9-4.7 Ma; Grand Valley fault, 5-3 Ma; and Teton fault, 3-km offset in last 2 Ma. Outward migration of faulting is shown by major activity on the Grand Valley fault 5-3 Ma followed by near quiescence, whereas activity on the Star valley fault (a southward continuation of the Grand Valley fault) has been high (about 1 mm/yr) in the last 15,000 yr.

North of the plain, the belt of major Quaternary faulting includes the 1983 Borah Peak (M_s 7.3) and 1959 Hegben Lake (M_s 7.5) earthquakes. The area between this belt and the plain increases in width away from Yellowstone; Quaternary faulting continues but at diminished rates in this area.

This temporal change in faulting and volcanism in the eastern SRP region suggests that Basin-and-Range extension has been localized by crustal heating occurring both along with and outward from the track of a "hotspot" or other heat source. The outward migration of heat may be primarily by convection in the asthenosphere aided by conduction in the lithosphere. Faulting slowed or ceased after the crust had thinned by extension and had either cooled or stopped heating.

№ 7933

A FAULT SCARP ACROSS THE YELLOWSTONE CALDERA MARGIN: ITS MORPHOLOGY AND IMPLICATIONS

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Both the intermountain seismic belt and the Yellowstone caldera are characterized by Quaternary faulting, yet their interaction is seldom observed. A N-S fault scarp, mapped in part by the USGS (1972) and Richmond (1974), parallels the regional extensional trend and crosscuts the interpreted caldera boundary. Field mapping and levelling profiles surveyed across scarp segments allow the interpretation of approximate age of the faulting event, thus addressing the problems of tectonic evolution and geologic hazard in the Yellowstone region.

Based on published and unpublished mapping, the scarp is interpreted as continuous for at least 5 km, with subaqueous extension of unknown length. Over most of its subaerial exposure it has graben morphology with maximum net uplift on the western block, exceeding 10 m at one locality. Most of that exposure lies within 30 m vertically of lake level, thus cuts across postglacial terraces of Yellowstone Lake. The terraces are crosscut to within 4 m of lake datum, at which point they truncate the scarps. Where the scarp cuts lakeshore sediments, mainly gravels, it is amenable to morphological characterization and possibly dating. The entire scarp length lies within lodgepole pine forest.

Twenty-five profiles were surveyed to 0.01 m precision across major and minor E- and W-facing scarps associated with the fault. They show the anticipated progression of increasing maximum steepness with scarp height. Of those profiles not effected by shallow bedrock, only one differs significantly from a steepness/log height regression. Application of published rate constants (Mayer, 1984) suggests an age of 1000± 200 years, but the material, vegetation, and climate suggest a greater uncertainty. Thus regional tectonic stresses acting across a "locked" caldera boundary have probably generated at least one M 6+ earthquake within the Yellowstone caldera within the last 1000± years.

№ 16738

LATE PLEISTOCENE TURTLES FROM THE AMERICAN FALLS RESERVOIR, SOUTHEASTERN IDAHO

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The occurrence of Chelydra serpentina and Chrysemys picta in fluvial deposits of the ancestral Snake River (>72,000 YBP) not only represents the first records of turtles from the Pleistocene of Idaho, but it also poses some interesting paleoecologic and biogeographic problems. Turtles are relatively common in Mio-Pliocene deposits of the western Snake River Plain but are absent from deposits of the Bonneville Flood (ca. 15,000 YBP) and from the modern fauna of the Snake River. We attribute their late Pleistocene disappearance to a succession of summers that were too cool to permit successful hatching.

While the current range of C. picta does extend west of the continental divide through northern Idaho and southern Canada and includes a portion of the Columbia River, that of Chelydra is strictly east of the divide. A late Pleistocene Chelydra has been reported from southern Nevada (Van Devender and Tessman, 1975). Snapping turtles may have entered the Snake River drainage by crossing the subdued continental divide in the region of Yellowstone Park or as doming of the Yellowstone area diverted drainage patterns. Subsequent diversion or drainage reversal between the Snake River and Lake Bonneville Basins could have provided a route into the Great Basin and southern Nevada.

№ 20609

COMPOSITIONAL TRENDS IN LATE CRETACEOUS LITTLE MUDDY CREEK AND SPHINX CONGLOMERATES AS SIGNATURES OF TIMING OF THRUST-RELATED DEFORMATION

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Compositional data in the form of clast and point counts were analysed from two Laramide synorogenic conglomerates. The Little Muddy Creek Conglomerate was shed from the thin-skinned Absaroka thrust sheet of the Wyoming fold-thrust belt. The Sphinx Conglomerate was deposited in front of the Scarface thrust, a thick-skinned, foreland thrust in southwestern Montana. Trends in composition reflect changing provenance as source lithologies were uplifted during thrusting. Exposure of lithologies on thrust sheets is a function of structure created by thrusting, uplift rates, and denudation rates. Models incorporating these factors were generated for the Absaroka and Scarface thrust sheets and resulting hypothetical conglomerate compositions were compared to actual data.

Areas distal to thrust activity are less subject to thrust-related deformation and cannibalization. Consequently, compositional data from sedimentologically distal realms of thrust-derived conglomerates provide a more complete record of syntectonic deposition than do those of proximal realms. Proximal to the Scarface thrust, the Sphinx Conglomerate overlies the Maastrichtian Livingston Formation with marked angular unconformity. Published compositional data from these parts of the Sphinx offer an incomplete record of early syntectonic deposition. In its distal realms, the Sphinx lies conformably above the Livingston Formation. Compositional trends indicate that initial syntectonic deposition is represented by the upper Livingston, which is sedimentologically and compositionally gradational with lower Sphinx. An incomplete compositional record of syntectonic deposition is present in the Little Muddy Creek Conglomerate. Analogous with proximal realms of Sphinx, the Little Muddy Creek Conglomerate lies unconformably above the Santonian Hilliard Shale. Distal realms of the Little Muddy Creek Conglomerate that would likely contain a more complete compositional record of initial thrusting have not been recognized.

№ 2496

UNFINISHED BUSINESS IN THE IDAHO-WYOMING THRUST BELT

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During more than 30 successive field seasons in the Idaho-Wyoming thrust belt, Steven S. Oriel mapped about 2½ square degrees with various coworkers. Most of his maps are published, but not all. In the last few years, he began to say he hadn't finished. What had he not found out with so much systematic mapping? Here are some of the questions he considered worth pursuing:

1. Regional extent of Quaternary faulting
2. Regional variations in the Salt Lake Formation, including eruptive center and provenance of clasts
3. Conditions which favored development of diamictite in the Salt Lake Formation and in the Wasatch Formation, including climate, bedrock type and topography at the time
4. Timing of normal fault sets before, during and after the Salt Lake Formation, and their connections to "Basin and Range" and/or Snake River downwarp processes
5. Relation of the hinterland to thrusting farther east and the location of detachments beneath the hinterland, for example the decollement horizons for the Putnam thrust east of Pocatello
6. Stratigraphic variations in many Systems, especially the Lower Cambrian and uppermost Proterozoic, the Triassic and the middle part of the Cretaceous.

These and other topics developed out of his progressive mapping, and they are exactly the sorts of questions that a person like him, a general regional geologist, would ask. Along with his many accomplishments, these questions are a sort of legacy, left for us to pursue with new mapping, new fossil collections, seismic and other geophysical exploration, and the drill.